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ON INTRAOCULAR SYRINGING IN CATARACT EXTRACTION WITH A REPORT OF FIFTY-THREE OPERATIONS.

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The history of medicine in all its departments thoroughly illustrates the war incessantly waged between the progressive and the conservative elements in human nature. In our nineteenth century, especially its latter half, *laissez-faire* appears to be at a discount. "Forgetting the things that are behind, we reach forward" with almost feverish avidity after a more refined diagnosis, more satisfactory therapeutics, and more efficient methods in surgery.

In the domain of ophthalmic surgery we observe the same unrest, the same stirring up of the dry bones, the same fearless discussion of principles once supposed to be forever settled by the authority of great names; *Nullius addictus jurare in verba magistri.* For example, it was long considered that in the method of operating for cataract proposed by the immortal von Graefe high water mark had been reached; but the

method has been since so greatly modified that the father of the Graefe operation would not recognize his own child. Even the iridectomy has been attacked, and its necessity questioned by some of the most eminent operators, and a general return to the simple operation, as it is called, confidently predicted. It is not the purpose of the writer of this paper to enter into the merits of the iridectomy question, which may for the present be regarded as *sub judice*. He will content himself with saying that, while the statistics presented by De Wecker, Knapp, and other advocates of the simple operation would be difficult to improve upon, he scarcely feels justified in abandoning a method which seems to him to be founded on reason and approved by experience.

The most important innovation introduced within recent years into the operation for the extraction of cataract is the injection of fluids into the anterior chamber after the expulsion of the lens. This procedure was instituted, or rather reintroduced[1] in 1884 by McKeown, of Belfast, but was almost simultaneously practised by Wicherkiewicz, and was soon taken up by Panas, DeWecker, Knapp, Grand-Clement, Khodine, Chodin, Lee, Bell and others. Up to the present time McKeown's following is not extensive, a fact which is not surprising when we consider the novelty and the apparently formidable nature of the method inaugurated by him.

I began to syringe out cortical remains October 17, 1888, from which date to June 4, 1890, I have made 57 extractions, using the syringe in all but four cases, being prevented from using it in these by rupture of the zonule either before or coincidently with the escape of the nucleus, attended with loss or threatened loss of vitreous. Of the 57 operations 4 were made so recently that I cannot report the visual results beyond saying that they are all successful.

The remaining 53 cases, including, to complete the record 3 cases in which irrigation was not employed, are presented in tabulated form.

[1]Magnus in v. Greafe's Archiv f. Ophth. xxxiv, 2 s. 167..

In all of the cases a preliminary iridectomy had been made. The size of the iridectomy varied from a generous coloboma when the pupil was rigid, to an approximately pure sphincterectomy when the pupil was freely dilatable.

Mode of operating.—The instruments, after careful cleansing, were allowed to remain in absolute alcohol during cocainization of the eye, which consumed from fifteen to twenty minutes. During the same time an adequate supply of boric acid solution, $^1/_2$ of 1%, made with distilled water and then boiled and filtered, was warmed, and a portion placed in a large Graefe's undine by means of which the eye and its environment were long and thoroughly flushed, the patient being at the time encouraged to keep opening and shutting the lids and rolling the eyeball, so that the retrotarsal folds were pretty completely cleansed. During the cleansing process the instruments were transferred from the alcohol to a vessel containing some of the boric solution.

The lid speculum was now applied; and with a Graefe knife a large incision was made at the corneal margin (usually the lower) but entirely in corneal tissue. The laceration of the capsule was made in the shape of an inverted T with its horizontal portion near the lower margin of the lens. Immediately after the corneal incision, and again after the capsulotomy, the eyeball was freely irrigated with the boric solution. In case of hæmorrhage further steps were delayed until that was checked; and, in the few cases in which blood entered the anterior chamber, it was removed as thoroughly as possible by means of the syringe either before or after the capsulotomy. The speculum was now removed and the lids gently wiped dry. The upper lid was then drawn slightly upward with the thumb, the latter being so applied that its lateral edge near the tip rested securely on the edge of the lid. Pressure being now made (through the lid) the lens was, as a rule, easily expelled. Counter-pressure on the lower lip of the wound was, however, sometimes made either directly with the tortoise-shell spoon, or with the index finger of the other hand through the medium of the inferior tarsal cartilage.

After giving the patient a moment's rest, the syringe nozzle was then introduced, and a larger or smaller quantity of the boric solution was allowed to run in and out again, the nozzle being meanwhile moved gently from one end of the incision to the other. In general the anterior chamber was thus rapidly cleared; but in some cases in which small masses clung tenaciously to the pupil edges, the point of the nozzle was pushed on until actual contact, aided by the continuous flow, dislodged the mass and drove it out of the chamber. Two or three drachms of the solution generally sufficed, but not infrequently an ounce was used, and in a few cases two ounces or more. In no case was there any manipulation of the cornea after the escape of the nucleus, and in no case was any instrument such as the tortoise-shell scoop permitted to touch the corneal surface for any purpose. After having examined the wound to see that no portion of iris or remnant of capsule had insinuated itself between the lips, the eye was again flushed with the solution, a drop of atropine instilled, and a cheese-cloth pressure bandage applied.

In cases in which the lens was clearly milky, or in which the suspensory ligament was suspected to be weak, or the vitreous to be fluid, the lid speculum was removed before the introduction of the cystotome. The advantages of this precaution were illustrated in several of the cases. Almost without exception the operation was performed by the searching light supplied by a portable electric lamp furnished with a condensing lens. In this manner the presence of cortical remains can probably be detected better than by any other means—certainly better than by the best daylight. The operation was always performed in the recumbent position—when feasible on the bed which the patient was to occupy—otherwise on an operating table from which the patient was lifted to the bed by means of a sheet. The recumbent position was maintained for five or six days, permission being given to lie on the side not operated upon within an hour or two after the operation. The bandage was left undisturbed for three or four days unless there was some discomfort, which was rare. On the fifth or

sixth day the bandage was finally removed and a hollow eye-shade similar to that described by Dr. Gifford in the January number of the *Arch. of Ophthal.*, and which I have used for many years, substituted. When the healing process was slow the pressure bandage was retained until the wound was united.

The essential particulars of each case are presented in the following table:

No.—Age. Sex. Health.	*Quality of Cataract.—Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
1 72 F. Fair.	Glaucomatous. Previous iridectomy; limited visual field.	Oct. 17, '88. Cortical abundant. Easily removed with a *compte-gouttes* armed with curved silver nozzle. Air bubble entered chamber and removed by continuing irrigation. 16 days.	Dec. 13, '89. +10 D. S.=$^{30}/_{60}$ Media clear. Well-marked cupping of disc.
2 55 F. Good.	Hard. Mature. Normal.	Oct. 23, '88. Irrigation by means of pipette used in Case No. 1. Smooth. 12 days.	Feb. 12, '89. +12+1c Hor. S.=$^{30}/_{40}$. Feb. 13, '90. +12=$^{20}/_{30}$.
3 67 F. Good.	" "	Oct. 25, '88. Smooth. 11 days.	Jan. 11, '89. +5.5+ 2-5c 18°. S.=$^{20}/_{30}$
4 72 M. Good. Family history of mental derangement.	" "	Nov 15, '88. Ant. chamber irrigated with specially devised syringe. 28 hours after operation, patient discovered walking about hospital with bandages off. Delirious for 24 hours Smooth. 12 days.	March 4, '89. +13D. S.=$^{20}/_{20}$—
5 66 F. Feeble	Hard. Mature. Projection not very good.	Dec. 12, '88. Cornea flabby and wrinkled after incision. Smooth. 10 days.	Jan. 4, '88. +9D. S. =$^{20}/_{80}$ Media clear. Optic nerve atrophic
6 72 F. Good.	Hard. Hypermature, normal.	Dec. 14, '88. Much cortical syringed out. Smooth. 11 days.	March 3. '89. +11+ 1.5c Hor. S=$^{20}/_{80}$
7 64 F. Feeble Decided mental hebetude.	Hard. Mature Apparently normal.	Feb. 15, '89. After irrigation formed. Capsule quite opaque. April 24, '89. Removed opaque capsule through a small corneal incision. 19 days.	Soon after operation about $^{20}/_{200}$ June 5, '89, (after secondary operation) with +10 +1.5c Hor. S=$^{20}/_{40}$
8 58 M. Good.	Hard. Mature. Normal.	March 1, '89. Smooth. 10 days.	March 26, '89. +12.5 S.=$^{20}/_{30}$
9 55 M. Good.	Complicated. Partly transparent; always near-sighted. Normal.	March 1, '89. Syringe brought out considerable quantity of soft cortex. Smooth. 10 days. May 11, '90 States that eight months after operation received a violent blow on eye. Since which sight poor.	S.=$^{20}/_{100}$ No glass helps. Media clear. Large staph. post. Says that up to accident he "could read a newspaper through without glasses even by lamplight."
10 62 F. Feeble	Hard. Hypermature. Projection poor.	March 15, '89. Smooth. 12 days.	May 25, '89. +20. S. =$^{8}/_{100}$ Media clear. Disc atrophied. Sept. 3, '89. S.= $^{15}/_{200}$
11 67 F. Fair.	Hard. Mature. Normal.	March 15, '89 Smooth. 21 days.	May 22, '89. +12 D. S.=$^{20}/_{20}$

No.—Age. Sex. Health.	*Quality of Cataract.—Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
12 64 F. Good.	Hard. Mature. Normal.	April 2, '89. Considerable cortical remains. Small masses persistently adhere to pupil margins and detached by touching with syringe nozzle. Smooth 14 days.	May 23, '89. With +11+1.5c 5°. S.=$^{20}/_{20}$— March 6 '90. Cannot see so well. Has been very ill for several weeks. S.=$^{20}/_{100}$. Slight opacity of capsule. Discission. May 14, '90. +10+1 5c Hor. S.=$^{20}/_{40}$ Slight opacity of capsule remains.
13 71 F. Good.	Hard. Hypermature. Normal.	May 6, '89. Smooth. 14 days.	June 20, '89. +9+3c 8°. S=$^{20}/_{40}$. Capsule opaque.
14 70 M. Good.	Hard. Mature. Normal.	May 9, '89. Smooth. Patient became delirious 12 hours after operation, and remained so about 24 hours. 16 days.	July 7, '89. +10.5. S.=$^{20}/_{20}$
15 38 M.	Soft. Traumatic. Extensive ant synechia.	May 10, '89. Iritomy with De Wecker's scissors. Soft lens tissue removed with syringe.	July 1, '89. +11. S=. $^{20}/_{60}$ Some opacity of capsule.
16 65 F. Fair.	Hard. Mature. Normal.(Other eye enucleated after cataract operation by another surgeon.)	July 9, '89. Smooth. 10 days.	Jan. 9, '90. +11 D. S =$^{20}/_{30}$
17 22 M. Good.	Soft. Hypermature. Good.	Oct. 2, '89. Nucleus small, most of lens remaining in ant chamber before irrigation.	April 2. 90. +10 D. S.=$^{20}/_{80}$
18 74 F. Good.	Cataract lactea. Good.	Oct. 6, '89. Lens-matter like whey. Small nucleus. Smooth. 16 days.	Nov. 12, '89. +10 D. S.=$^{20}/_{30}$
19 84 M. Good.	Hard. Mature. Normal.	Oct. 9, '89. Smooth. 10 days.	Nov. 26, '89. +11+2 c, 170°. S.=$^{20}/_{20}$
20 60 M. Good.	Fundus reflex good through periphery. S=$^{2}/_{200}$. Projection normal	Oct. 12, '80. After expulsion leas remarkably transparent at margins. Clear lens-matter easily syringed out. Smooth. 10 days.	Nov. 16, '89. +11.+2.25c Hor. S.=$^{20}/_{20}$—
21 49 M. Good.	R. E. Soft. Mature. Normal.	Dec. 3, '89. Cortical abundant Syringed more than 2 ounces boric solution into chamber. Smooth. 11 days.	Dec. 30, '89. +5.+3.c Hor. S.=$^{20}/_{20}$ April 26, '90. +6. +1.25c 62°. S.=$^{20}/_{20}$+

No.— Age. Sex. Health.	*Quality of Cataract.—Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
22 56 M. Feeble	Hard. Mature. Normal. Other eye removed for iridocyclitis after cataract extraction by another operator.	Dec. 6, '89. Operation clean and satisfactory. Night of 8th day, struck his eye during sleep. Mild attack of iritis which yielded to treatment in a few days. 15 days.	Jan. 9, '90. +6.5+ 2c Hor. S.=$^{20}/_{30}$ April 17, 90. +7.+ .5c Vert. S.=$^{20}/_{20}$—
23 50 F. Good.	R. E. Soft. Mature. Normal.	Dec 9, '89. Smooth. 12 days.	Jan. 11, '90. +11+ 2.5c Hor. S.=$^{20}/_{40}$ —. April 8, '90. Discission of capsule. May 26, '90. +11+ 2c Hor. S.=$^{20}/_{30}$
24 70 F Feeble	Hard. Mature. Nnormal.	Dec. 12, '89. Smooth. 9 days.	April 2. '90. +11.+ 2.c 138°. S.=$^{20}/_{20}$—
25 54 F. Good.	Soft. Hypermature. Normal.	Dec. 16, '89. Capsule very opaq e except small point below. Smooth. 17 days.	April 23, '90. +8. S. =$^{10}/_{200}$
26 71 M. Good.	Hard. Hypermature. Normal.	Dec. 16, '89. Smooth. 8 days. May 10, '90. Ophthalmosc. examination negative. Says he "can see better than ever."	March 13, '90. +9.+ 1.c Hor. S.=$^{20}/_{40}$+ May 10, '90. Media absolutely clear.
27 65 F. Good.	Hard. Mature. Normal.	Dec. 20, '89. Smooth. 13 days.	Feb. 28, '90.+9.+2c, 178°. S.=$^{20}/_{30}$
28 55 M. Good	" "	Dec. 21, '89. Smooth. 12 days.	March 31, '90. +10. S.=$^{20}/_{20}$.
29 53 M. Good.	Completely fluid. Good.	Jan. 1, '90. On using cyst tome liquid lens-matter gushed out followed by vitreous which was also fluid. *Syringe not used* Healing slow. 23 days.	March 13, '90. +8.5+ 2.c 80°. S.=$^{20}/_{40}$
30 56 M. Good.	Soft. Mature. Not tested.	Jan. 1, '90. Operation satisfactory. Iritis 9th day from exposure to a cold daught. Recovery in 12 days. Jan. 25, '90. Ano her attack from same cause Recovery in two weeks. For safety, retained in hospital till 54th day. No synechiæ.	March 18, '90. +9.+ 1.75c Hor. S.=$^{20}/_{40}$ +. Media clear. Nerve decidedly atrophic. Pupil free.
31 56 F. Feeble	Hard. Mature. Normal.	Jan. 1, '90. Smooth. 12 days.	April 3, '90. +12.+ 1c Hor. S.=$^{20}/_{20}$
32 48 M. Good	Soft. Mature.	Jan. 4, '90. Operation satisfactory. Jan. 5, 28 hours after operation, found patient with bandage off. Eyes re-bandaged. Two hours later, patient again removed bandage, stole out of hospital, and went to his home, four miles away, walking much of the distance. 1 day.	April 23, '90. +11.+ 1c Vert. S.=$^{20}/_{30}$+

No.— Age. Sex. Health.	*Quality of Cataract.--Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
33 40 F Good.	Soft. Hypermature. Projection not good.	Feb. 11, '90. Nucleus 5 mm. in diameter. Cortex liquid. Smooth. 9 days.	Feb. 24, '90. +S.D. S.=$^{20}/_{200}$ Capsule clear. Floating opacities in vitreous.
34 76 M. Good.	Hard. Hypermature. (7 years old.) Normal.	Feb. 22, '90. Vitreous escaped with lens. *Syringe not used.* Smooth. 11 days.	April 24, '90. +.11+ 1c Hor. S.=$^{20}/_{60}$ Media transparent.
35 74 F.	R. E. Hard. Mature. Normal.	Feb. 22, '90. Operation satisfactory, a though patient was very restless and almost unmanageable. Smooth. 16 days.	March 31, '90. +11. S.=$^{20}/_{60}$—
36 54 M. Good.	Soft. Mature. Normal Stricture nasal duct treated before operating on cataract.	Feb. 28, '90. Smooth. 13 days.	April 15. '90. +9+ 1c Hor. S.=$^{20}/_{30}$+ May 15, '90. +9+ 1.5c 10°. S.=$^{20}/_{15}$
37 68 M. Fair.	Hard. Hypermature. Projection poor. Other eye light perception, extremely feeble.	March 4, '90. Patient nearly completely deaf and of feeble intelligence, Eye ball rolled incessantly. Still operation was completed pretty satisfactorily. But before the bandage was applied patient suddenly and violently snapped his eyelids together, rupturing capsule or zonula and forcing fluid vitreous from the wound. Healing process, smooth. 16 days.	March 20, '90. S.= Light perception. Vitreous muddy. Very small retinal detachment below and outward.
38 38 F. Good.	R. E. Soft. Hypermature. (6 years.) Normal.	March 11, '90. Much cortical syringed out. 11 days.	April 26, 90. +7.5+ 3.5 8°. S.=$^{20}/_{20}$—
39 49 M. Good.	L. E. Soft. Mature. Normal.	March 26, '90. Abundant cortical syringed out Smooth. 11 days.	May 9, '90. +6+2.25c 172°. S.=$^{20}/_{12}$
40 61 M. Good.	Complicated. Hypermature Corneal opacities from old ulcers.	March 27, '90. Healing rather slow. 13 days.	April 18, '60. +11+ 3.5c Hor. S.=$^{20}/_{60}$
41 F.	Hard. Mature. Normal.	April 4, '90. Opaque capsule left. April 9, mild attack of irritis with no pain and but slight congestion. Pupil good size, but small synechia at upper part.	April 24, '90. +10+ 1.5c Hor. S.=$^{20}/_{60}$ May 12, '90. +9.5 +5c Hor. S.=$^{20}/_{40}$

No.—Age. Sex. Health.	*Quality of Cataract.—Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
42 58 M. Feeble	L. E. Opaque in centre but translucent in in periphery. Duration many years. R. E. in 1886, showed incipient cataract and marked signs of old choroiditis.	April 6, '90. L. E. Nucleus small. Syringed out large quantity of transparent cortical. Smooth. 9 days.	June 7, '90. +12+1c Hor. S.=$^{20}/_{20}$
43 52 M. Good.	Soft. Mature. Normal.	April 6, '90. In using cystotome this instrument, acting as a hook, tore off anterior capsule leaving it attached just inside of wound. Nucleus small. Large quantity of cortical syringed out. Finally the reflected ant. capsule was removed with iris forceps. Smooth. 9 days.	May 13, 90. +9+ 1.25c Hor. S.= $^{20}/_{20}$—
44 70 M. Good	Hard. Partly transparent. No change for several months. Normal.	April 8, 1890. Smooth. 9 days.	April 26, '90. +10+ 1.25c Hor. S.=$^{20}/_{40}$ —. Capsule perfectly clear. Several small brownish patches on retina in macular region.
45 65 F. Good.	Hard. Mature. Projection poor. Patient greatly addicted to alcohol.	April 8, '90. Smooth. 11 days.	April 25, '90. +10. S.=$^{20}/_{60}$— Media perfectly clear. Decided bluish atrophy of disc.
46 64 M. Good.	Cat. lactea. Duration at least 10 years. Normal.	April 11, '90. The instant cystitome touched capsule, most of lens spurted out in shape of thin whey-like fluid. Nucleus, 3 mm. in diameter, retreated into upper part of chamber, but was slowly coaxed down by manipulating upper lid. Pupil made jet-black instantaneously by use of syringe. Smooth. 9 days.	May 5, '90. +9. S.= $^{20}/_{20}$—

No.—Age. Sex. Health.	*Quality of Cataract.—Functional Examination.*	*Operation.—Idcidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
47 60 M. Feeble Face deeply furrowed and covered with eczema.	Hard. Mature. Normal.	April 14, '90. Eye well in a week. Patient attacked with bronchitis on 8th day. Discharged cured 10 days later.	May 12, '90. +10+ 1c Hor. S.=$^{20}/_{40}$+
48 82 F. Very feeble in body & mind	Hard Mature. Doubtful. Other eye no light perception.	April 16, '90. Operation satisfactory and everything favorable till 12th day, when slight congestion appeared with a burning sensation but no pain. 8 days later eye clear and pupil large, but a slight adhesion at upper pupillary margin. 20 days.	May 31, '90. +10 D. S.=$^{20}/_{200}$ Media perfectly clear. Nerve markedly atrophied.
49 61 F. Not good.	Hard. Hypermature. Normal.	April 19, '90. Incision completed with more than usual care and without dragging. Lens came well forward. On gently introducing cystitome lens retreated upwards a little. Tentative, expulsive movements caused vitreous to appear in wound. With wire scoop delivered cataract which was large and very hard and dark. Small bead of vitreous escaped. *Syringe not used.* 15 days.	May 14, '90. +11+ 1c Hor. S.=$^{20}/_{20}$—
50 62 F. Fair.	Nucleus and post. capsule opaque. Other parts of lens translucent. Condition stationary for years. Very poor projection. Eye always strabismic & "weak,"	April 21, '90. Sockets remarkably deep. Patient greatly agitated. Eye rolling constantly. Lens, on being expelled, was quite large and quite translucent except in centre and at posterior pole. Slight catarrhal conjunctivitis in both eyes. 8 days.	May 11, '90 +8. S.=$^{10}/_{200}$. Lower half of capsule clear. Part just above centre opaque. Floating opacities in vitreous. Large patch of atrophy of choroid below and to outer side of macular region.
51 75 M. Good.	Hard. Partly translucent. Stationary. Good.	April 28, '90. Lens on expulsion amber colored but transparent in periphery. Some cortex left in chamber, easily and quickly expelled by syringing. 8 days.	May 26, '90. +8+3.5c Hor.=$^{20}/_{20}$—

No.— Age. Sex. Health.	*Quality of Cataract.--Functional Examination.*	*Operation.—Incidents.—Course of Healing Process.—Duration of Treatment.*	*Resulting Vision.*
52 75 M. Good.	Hard. Mature Good.	May 12, '90. Nucleus dark. Unusual quantity of cortical syringed out. Some catarrhal conjunctivitis. 12 days.	June 9, '90. +10+2c Hor. S.=$^{20}/_{60}$ and improving. Slight opacity of capsule, apparently diminishing.
53 98 F. Good.	Hard. Mature. Normal.	May 27, '90. Smooth. 12 days.	June 9, '90. +10+1c Hor. S.=$^{20}/_{40}$ Capsule slightly opaque. Sight improving.

TABLE II.—SUMMARY OF VISUAL RESULTS.

$^{20}/_{12}$	1 Case.
$^{20}/_{15}$	1 "
$^{20}/_{20+}$	1 "
$^{20}/_{20}$	6 Cases.
$^{20}/_{20-}$	9 "
$^{20}/_{30}$	9 "
$^{20}/_{40}$	9 "
$^{20}/_{60}$	8 "
$^{20}/_{80}$	2 "
$^{20}/_{100}$	1 Case.
$^{20}/_{200}$	2 Cases
$^{15}/_{200}$	1 Case.
$^{10}/_{200}$	2 Cases.
0	1 Case.
Total	53 Cases.

I. E. Success in 98.$^{1}/_{10}$ per cent. Failure in $1^{9}/_{10}$ per cent.

Reviewing the cases detailed above we may consider

A.—Accidents and Abnormalities During Operation.

1. Air entered anterior chamber in one case (No. 1) owing to imperfect instrument. Result good.

2. Vitreous escaped in four cases—in three (Nos. 29, 34 and 49) immediately after exit of lens, so that the syringe was not used. In case No. 29 the lens, which was wholly fluid, gushed out at touch of cystome, followed by vitreous. In case No. 49 the lens was large and nearly black. Zonule ruptured during corneal incision, which was made slowly. On attempting expulsion vitreous presented in wound. Extraction effected easily with wire scoop—followed by small bead of vitreous. In case No. 34 moderate amount of vitreous followed lens. In the fourth case (No. 37) the patient was almost stone deaf, and besides, excessively restless. Nevertheless operation proceeded smoothly until the bandage was about to be applied, when a most violent orbicular spasm ruptured the posterior capsule and forced out a considerable quantity of watery vitreous, producing the only case of failure in the series. The three other cases had a good result.

3. Lens almost completely liquid in three cases (Nos. 18, 33 and 46), and completely so in one case (No. 29). Results in all good.

4. Cataract more or less translucent in five cases (Nos. 20, 42, 44, 50 and 51). Results in four good. In one (No. 50) only moderate, owing to antecedent disease of the vitreous and fundus. In this case the prognosis was bad, although an accurate diagnosis was impossible; but my habit is to operate on all cases in which there is a hope (happily realized in this instance) of even slightly ameliorating the patient's condition.

B.—Complications During the Healing Process.

1. Slow healing of the wound in two cases (Nos. 29 and 40). In the first there was escape of vitreous, preventing the use of

the syringe. V.=$^{20}/_{XL}$. In the second the slow healing may have been due to the nutrition of the cornea being interfered with by old ulceration, which had led to corneal opacities. V.=$^{20}/_{LX}$.

2. Delirium in two cases (Nos. 4 and 14), perhaps from cocaine. One of them (No. 4) was eccentric, and family mental history not good. Result $^{20}/_{XX}$ and $^{20}/_{XX}$—.

3. Iritis in four cases (Nos. 22, 30, 41 and 48). As this was really the only important complication observed during treatment, the cases may be analyzed in detail.

CASE 22.—Operation smooth. Syringe used freely. Eighth day condition of eye perfect. That night patient suddenly awoke in the act of striking his eye. Next day pain and other symptoms of iritis which subsided in a few days, leaving no adhesion. V.=$^{20}/_{XX}$—. The other eye had been enucleated by myself for irido-cyclitis following cataract extraction by another surgeon.

CASE 30. Operation smooth. Syringed. On ninth day eye looked well. Carelessly exposed himself to cold draught from open window. Next day globe congested and soon livid and chemosed. Iritis subsided in 12 days. Several days later exposure to cold draught from a badly constructed door brought on another, similar attack. Recovery in about two weeks. No synechiæ. V.=$^{20}/_{LX}$+.

CASE 41. Very opaque capsule left at operation. On fifth day I observed evidences of iritis, but they were so mild that the patient was unaware of anything being wrong. Result, small synechia above. Capsule clear in limited area below. V.=$^{20}/_{LX}$.

CASE 48. Health and mind feeble and functional examination difficult. Operation smooth. Everything favorable till twelfth day, when slight congestion was noticed. No pain, but some burning complained of. The iritis subsided in about a week leaving a small synechia at upper part. Rest of pupil, which was large, was free, and capsule, except at point of adhesion, perfectly transparent. V.=$^{20}/_{CC}$. Marked atrophy of disc.

Of these four cases of iritis, two were apparently caused by exposure to cold, and one was due to a blow. The remaining one was doubtless connected directly with the operation. All but one were mild, and probably none had any serious effect on the resulting vision.

In the case in which the operation failed there was no inflammatory symptom. The wound healed promptly and kindly, and in a week the eye, externally, presented all the appearances of a successful extraction. There was in the whole series no case of irido-cyclitis or of suppuration, and, excepting in two of the iritis cases, no serious discomfort was complained of.

In view of the progress made in recent years, perhaps the time has arrived when we should no longer be content with the old idea of a successful cataract operation, viz.: one which in a general way restores sight, but should endeavor to procure the highest degree of acuity of vision attainable in each case. In order to determine the methods by which this result may be most easily arrived at, it is desirable not merely to compare the final visual results reached under different methods, but to inquire into the circumstances under which, in each case, these results were brought about. No surgeon operates on a totally blind eye, *i. e.*, every man "selects his cases;" but, owing to differences of temperament and other causes, this selection is made by different operators, and even by the same operator at different periods, according to rules which are far from uniform. For this reason, two men exhibiting equal skill, and pursuing the same method, may obtain visual results which are widely different.

It may be assumed that the best method of operating for cataract is the one which, other things being equal, enables us most completely to eliminate all obstructions to vision referable to the lens, in other words to make the operation surgically complete. As a contribution to this part of the subject, the following table has been prepared, giving, in all of my cases showing $^{20}/_{XL}$ or less, the causes, so far as ascertained, of the imperfect vision:

TABLE III.—SUMMARY OF CASES OF $^{20}/_{40}$ AND UNDER WITH CAUSES.

	Capsule Clear.									*Capsule Opaque.*	*Total.*
Vision.	*Atrophy of Nerve.*	*Atrophy from Glaucoma.*	*Atrophy. Choroidal*	*Staphyloma Posticum.*	*Retinal Disease.*	*Opacities in Vitreous.*	*Vitreous. Escape of*	*Cornea. Opacity of*	*Irreg. Ax. &c* *Undetermined*		
$^{20}/_{40}$					1		1		3	4	9
$^{20}/_{60}$	2	1					1	1	1	2	8
$^{20}/_{80}$	1								1		2
$^{20}/_{100}$				1							1
$^{20}/_{200}$	1					1					2
$^{15}/_{200}$	1										1
$^{0}/_{200}$			1							1	2
0							1				1
Total.	5	1	1	1	1	1	3	1	5	7	26

Thus of 53 cases operated upon, 7, or 13.2%, have been thus far left with opacity of the capsule, whereas in 45 cases (excluding the case of failure, and including the cases with $^{20}/_{XXX}$ and better), *i.e.*, in 84.9%, the operation was surgically complete.

Secondary Operations.—The statistics presented above show the results obtained without any secondary operation on the capsule except in three cases (Nos. 7, 12 and 23). In the first, an opaque capsule was removed through a small corneal incision, raising the vision from $^{20}/_{CC}$ to $^{20}/_{XL}$. In the second, discission raised the vision from $^{20}/_{C}$ to $^{20}/_{XL}$, but the operation was incomplete, and slight opacity still remains. In the third the sight was improved by discission from $^{20}/_{LX}$ to $^{20}/_{XXX}$. In other words, excluding the case of failure, 42 cases (including

all but one of the cases of $^{20}/_{XXX}$ and better) *i.e.*, 79.4% of all the cases operated upon, required no secondary operation.[1]

GENERAL REMARKS AND CONCLUSIONS.

There are several points in regard to the above reported series of cases that seem worthy of note:

1. The absence, excepting in one case (No. 41), of inflammation or irritation directly referable to the operation, and the absence, also excepting in one case (No. 30), of inflammation from any source serious enough to cause anxiety.

2. The large proportion of cases in which a high degree of visual acuity was obtained.

3. The large proportion of cases in which the operation was surgically complete, *i. e.*, in which no capsular opacity remained to be treated by secondary operation. (I make no note of the absence of suppurative inflammation because purulent processes, as remarked by Sattler[2], Knapp[3] and others, are of late becoming more and more rare.)

These advantages I cannot but think attributable in a large degree to the fact of the anterior chamber being so thoroughly cleared of residual cortex. No matter whether we agree with DeWecker[4] that inflammation after cataract extraction is due to sepsis conveyed through a migration cicatrix (*cicatrice à migration*), or with Meyer[5] that the sepsis is sometimes endogenous, or whether we hold that many cases of inflammation, whether purulent or non purulent, may be purely traumatic, it must be generally admitted that, whether simply as foreign material, or as a nidus for microbic multiplication, cortical remains may act as a predisposing cause of inflammatory action. It appears reasonable, also, to suppose that they may, by ad-

[1]It is probable that a number of these cases will in time develop "wrinkled capsule" and so require surgical interference. If so, an opportunity of recording such changes may present itself.

[2]Quoted by Knapp, Arch. of Ophth., vol. xvii, p. 69.

[3]Ibid.

[4]Annales d'Oculistique, c 1, p. 168.

[5]Annales d'Oculistique, c 2, p. 134.

hering to the capsule, cause or increase its opacity, and thus partially frustrate the object of the operation.

From all points of view, then, it seems proper that we should seek the means by which lenticular debris can be most gently, quickly and thoroughly removed. My own belief is that manipulation of the cornea is inadequate—may, when prolonged, be injurious—and that the end in view is best attained by irrigation. In addition to thoroughly evacuating the anterior chamber, the syringe gently replaces prolapsed iris, and completely cleanses the lips of the wound, thus securing perfect coaptation and rapid healing, and, incidentally, preventing the entrance of germs.

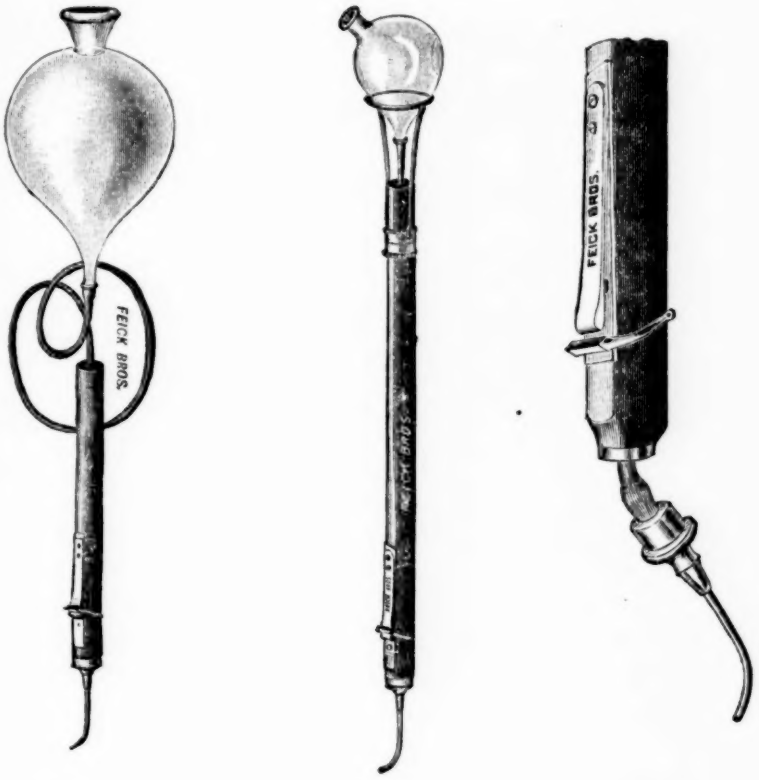
From what has preceded it is evident that I do not regard the injection of a few drops of an antiseptic solution in order to sterilize the contents of the anterior chamber, as fulfilling all the requirements. It may be doubted, without disrespect to the distinguished men who make use of this procedure, whether it accomplishes even the limited object aimed at; for an antiseptic, to be effective, must surely be dangerously irritating to the delicate structures in the interior of the eye.

But in point of fact antisepsis in surgery tends more and more to be replaced by asepsis. Germs are now flooded out, instead of being destroyed *in situ*. I believe the crowning glory of our era, in so far as surgery is concerned, to be the development of the science and art of cleanliness. In accordance with this view, the solution I use is not, strictly speaking, antiseptic. Practically, it consists of boiled distilled water containing just enough boric acid to prevent the injurious effects which have been found by myself and others to follow the use of water alone.

In order that irrigation of the anterior chamber may be accomplished effectively and safely it is important to employ a suitable instrument. At the last meeting of the American Ophthalmological Society, I read a paper on this subject[6], and described a syringe which consisted "essentially of a bit of black rubber tubing with a curved flat gold nozzle at one end

[6]Trans. Amer. Ophth. Soc. for 1889, p. 341.

and a small metal reservoir at the other." The tubing passed through a hollow hard rubber handle in which was fixed a short piston controlled by the index finger, and serving, by pressure on the rubber tubing, to stop or retard the current, Soon after that meeting, in order to be able to dispense with



Form 1. Form 2. Actual Size.

FIGS. 9, 10, 11.

an assistant, as well as to secure a uniform pressure, I had the instrument made in the form in which you see it (form 2). The reservoir, which is of glass, is attached to the upper end of the handle, and will hold about an ounce. This is sufficiently

large, because even if two or three times this quantity of fluid is required, the patient will be benefited by the momentary respite obtained while the reservoir is refilling; and the objections made to a second or third introduction of the nozzle are, in my opinion, entirely groundless. If, however, a larger reservoir is desired, and an assistant is available, the necessary change in the form of the instrument is easily effected by substituting a longer piece of rubber tubing.[7]

This syringe, as modified, has been used in the great majority of the cases reported in this paper; and, from experience during the year just past, I am in a position to reiterate with confidence the following statements made in the article referred to:

"1. As there is no backward flow, it (the syringe) has no tendency to become septic in use except at the point of the nozzle, and the latter can be readily pulled off and thrown into boiling water or alcohol. If the purity of the other parts of the apparatus is suspected, it is easy to place the reservoir in boiling water, and to replace the old rubber tubing with a new piece.

"2. This instrument can always be depended upon to work smoothly.

"3. It is held like a penholder, and is as easily and securely handled.

"4. As the ejecting force is proportional to the height of the column of liquid, it is of course under absolute control. * * *

Should a *per saltum* movement be desired, this can be effected * * * by intermittent pressure on the short piston.

"5. It goes without saying that in using this syringe there is no possibility of the entrance of air into the eye."

The instrument was made for me by Feick Bros., surgical instrument makers of Pittsburg, Pa.

[7]The syringe is made in such a way that forms 1 and 2 are quickly interchangeable. Thus the small reservoir may be removed from form 2 and the metal framework slipped off. All that remains, then, is to insert the small hard-rubber nozzle (which will be found at the lower end of the tubing belonging to the large reservoir) into the tubing which remains in the handle. The large reservoir can be fixed to an upright post attached to the bedstead, and the height regulated by a set-screw.

ELIMINATION OF THE CORNEA AND ITS EFFECT UPON THE REFRACTION OF THE EYE. THE DEVICE FOR ITS DEMONSTRATION MODIFIED.

BY DR. CARL KOLLER, NEW YORK, N. Y.

Read before the Section on Ophthalmology of the New York Academy of Medicine, May 21, 1890.

The Eye Under Water.—An old and well-known experiment shows that the fundus of an eye becomes visible without any further apparatus when the eye is placed under water. Provided that the pupil is large enough, one sees the optic disc and the retinal blood-vessels clearly defined in about their natural size. The reasons for this are obvious and identical with those which Helmholtz has given in order to explain, why, under ordinary conditions, we cannot see the fundus, and which have led him to the invention of the ophthalmoscope.

The investigators who had tried to explain the light seen in animals' eyes, as Joh. Mueller, Donders, and especially Bruecke, had already approached the truth, namely, that it is the position of the retina in the posterior focal plane of the dioptrical system, which prevents the light from issuing from the eye in another direction than that in which it entered the eye. Let us suppose a light is thrown from a certain point into the eye, and thus illuminates a portion of the retina. This portion of the retina now can be considered in itself as a source of light, but one, from which the light can go out in one direction only, that is, toward the original light-point. The whole cone of light, coming from the light-point in the retina when issuing from the eye at the anterior surface of the cornea, is refracted to a bundle of parallel

rays, which are also parallel to the so-called line of direction. This line of direction is the straight line drawn from the original point of light to its image on the retina. This relation makes it impossible, under ordinary circumstances, to see a portion of the retina lighted or light-giving. For if we place our eye behind the source of illumination it will be blinded by the light and will not be able to perceive the relatively weak light issuing from the fundus—and if, on the other hand, we place our eye between the eye under observation and the source of illumination, we shut out the light with our own head. Therefore, the pupil of an eye always appears black. In order to see the fundus of an eye, we have to make an arrangement which overcomes this difficulty. One arrangement of this kind is the principle which Helmholtz has used in his ophthalmoscope; another, that which later on Ruete applied to his ophthalmoscope. As Helmholtz, modestly speaking about his great invention, himself expressed it—to construct the ophthalmoscope it was only necessary to have clearly before one's mind the reasons why it is impossible to see into an eye under ordinary conditions.

With the eye situated under water the ordinary optical conditions are changed. The exterior surface of the cornea does no longer border on the air, the most active part in the whole dioptric system; it is surrounded by water, which has the same index of refraction as the corneal substance, and, therefore, eliminates the cornea in an optical sense. If the fundus is lighted with diffused light there is no reason why the light issuing from the fundus should not disperse in all directions, and indeed we can see the fundus of an eye under water from any direction.

Irideremia with Dislocation of the Lens.—The conditions in certain cases of irideremia with dislocation of the lens are similar. While assistant in Utrecht I saw a man whose right eye presented the following appearance as the result of a blow received many years ago: There was no iris visible; either it had been torn out of the eye, as it sometimes occurs, or it was folded backwards into the vitreous body. The lens was

dislocated downwards and its upper margin and upper half were visible in the lower half of the enlarged pupil. When the man was placed with his face toward the window — best opposite to a white cloud — one saw without applying any especial apparatus the optic disc and the retinal vessels very distinctly. The explanation of this phenomenon is this: By the incomplete dislocation of the lens, the unity of the dioptric system of the eye was destroyed. There were two optic systems, one lensless and one with the lens. The axis of the latter formed an angle with the axis of the former on account of the prismatic action of the partially dislocated lens. Light which had entered the eye in the one could leave it by the other. The observer did not shut out the light with his own head, as he does under normal conditions of the eye, and the great amount of light which could enter this irideremic eye furthermore increased the possibility of seeing the fundus.

Here, I like to mention, also, the interesting phenomenon of the appearance of the two discs when the observer looked in the usual way into the eye with the ophthalmoscope (inverted image.) The lens, occupying half of the pupil, acted as a prism, and through this another image of the fundus was produced besides the one seen through the lensless part of the pupil. These images were of different size, the upper one considerably larger on account of the hypermetropic refraction of the lensless system; they were, furthermore, not in the same plane, the one seen through the lensless system being nearer to the observer. Corresponding with the double ophthalmoscopic image, the patient had monocular double vision. The visibility of the retina in detachment and in cases of intraocular tumor, is due to the same reason, namely, that the retina is no longer situated in the posterior focal plane of the optic system, and thus all causes disappear why it should not be visible.

Bellarminoff's Device to Make the Fundus Visible.—Several years ago Bellarminoff has modified the experiment with the eye under water. After anæsthetizing the cornea with cocaine and dilating the pupil, he presses a plain glass plate

against the cornea, thus flattening it and eliminating its optical action. In this way the fundus becomes visible. Bellarminoff thought he had invented a method which could take the place of ordinary ophthalmoscopy, and which could be used without any previous practice. It seems to me that it is much more desirable that every physician should learn and practice the ordinary method; but the experiment in question is, nevertheless, an interesting and striking illustration of optical conditions.

Modification of Bellarminoff's Device.—In modifying Bellar minoff's experiments, I had glass shells made similar to artificial eyes, with a plain—concave meniscus in the place of the cornea, the concave side inside, the plain one outside. Mr. Brière, a skillful maker of artificial eyes, was kind enough to take great pains in making these shells. Such a shell is easily inserted into the conjunctival sac in front of the eye, previously anæsthetized by cocaine, and is so nicely kept in place by the lids, that it is unnecessary to press the glass plate against the cornea. I dilate the pupil previously with homatropine. If the conditions are favorable—that is, if the light of a white cloud is available and the strong reflection from the anterior plane surface is avoided by moistening it with a drop of water—one may see the fundus without resorting any further to reflected light. It will show better when strong light—either the light of a cloud or artificial light—is thrown into the eye by means of a reflector. The optic disc and the retinal vessels appear with great clearness; in their small size they present a striking and unexpected spectacle. They appear of nearly ordinary size, while we are accustomed to see them considerably magnified through the optic system of the eye, when looking at them in the ordinary way of ophthalmoscopy. The large field of vision obtained is also remarkable.

Size of the Disc when seen Through the Plane-Concave Meniscus. — When the eye is under water the fundus is actually seen a trifle magnified. The anterior surface of the cornea being eliminated and the separating surface between water and air being a plane one, there

would not be any magnifying power if the lens were not present.

The index of refraction of the vitreous and aqueous humors, corneal substance and water being the same (1.3365), except for the presence of the lens, the conditions would not differ from those of a posterior part of an eye situated under water after removal of the dioptric part of the eye. The lens in its place represents a refractive power of 10 dioptries. A simple calculation shows that the magnifying power amounts to about 6:5, so that a disc of the size of 1.5 mm. appears to have 1.81 mm. in diameter. But this holds good only when the curvature of the cornea is eliminated by the water. The conditions are changed when a meniscus of glass is used for that purpose. Taking the index of refraction for glass to be 1.5 on an average, the glass-meniscus in front of the less refracting cornea will act as a concave lens and therefore will make the fundus appear smaller.

A simple calculation shows the following: A disc of the actual size of 1.5 mm., which, when simply seen under water would appear 1.81 mm. large, has an apparent size of only 1.37 mm. when seen through the glass meniscus, which corresponds to a diminution of 9:10.

Possible Utility of the Device.—As to the possible practical value of the device described, I have to offer a suggestion. It might be used for determining the location of ecchinococci, foreign bodies, or obscurating membranes in the vitreous (provided the lens is transparent and the pupil can be dilated). In all of these instances we have to resort to calculation. Alfred Graefe's admirable results in operating for ecchinococci show his method of determining the place to be very exact. Still, it might effectually be supported by an additional examination of the fundus with the cornea eliminated in an optical sense. This might be even more useful in operations for lacerating obscurating membranes in the vitreous, an operation which has been introduced by A. v. Graefe and has been practiced lately to a larger extent by C. S. Bull.

Operations have to deal with distances and conditions as we ordinarily see them with our naked eyes only, without interference of any optical apparatus, and as such the cornea in front of the vitreous body must be considered. Elimination of the cornea probably will allow a better view and, so to say, more natural conception concerning the extent and situation of such membranes.

TWO CASES OF GUNSHOT WOUNDS OF THE EYEBALL.

BY CASEY A. WOOD, C.M., M.D., CHICAGO,

Instructor in Ophthalmology, Chicago Post Graduate Medical School.

Two things have probably happened when the eyeball recovers from the effects of a penetrating wound sufficiently to permit of the safe retention in the orbit, viz: the foreign body has not entered at the ciliary region and it has again passed out of the globe. I am aware that there are remarkable exceptions[1] to this rule but they are quite uncommon. Even where the foreign body lodges in the substance of the posterior bulbar wall and projects into the vitreous its presence is very likely to set up purulent choroiditis before the process of encapsulation has had time to go on[2].

The disastrous consequences of penetrating wounds in the "dangerous zone" of the ciliary region follow in the gunshot injuries in common with other forms of traumatism but there are some pecularities attending the former kind of injury which render it less dangerous than others, both in the ciliary region and elsewhere.

Indeed cases of recovery after gunshot wounds, with retention of a certain amount of vision, are not infrequent. Provided the projectile (or projectiles as in the case of small shot)be not too large the chances of ultimate vision are, *ceteris paribus* greater than in such forms of violent injury as stabs, wounds from glass, metal splinters, or bits of percussion caps, ruptures

[1]One of these is recorded in Carter & Frost's "Ophthalmic Surgery." English Ed., p. 271.

[2]Leber in Graefe and Saemisch, Bd. v, p. 745.

of the sclera from blows, etc. When a knife blade, a glass splinter or a piece of chisel penetrates the sclera it is more likely to carry infective germs into the cavity of the eyeball than is a shot already disinfected by the burning powder and by its friction with the air through which it passes[3].

Less likely also is the shot to disturb the ocular membranes, to make a ragged wound, or to remain in the cavity of the globe. It goes through and makes a "clean" passage; the wound shortly heals and it is afterwards often difficult to discover any external evidence of its entrance.

In scleral ruptures and in penetrating wounds made by the agent just mentioned the probability of other accidents is also greater than when small shot enters the eye. Among these are dislocation of the lens, retinal detachments, loss of vitreous and extensive intraocular hæmorrhages.

In a word, so far as the eye is concerned *the effects of wounds made by small pistol bullets and the various kinds of bird or buckshot are confined to the tissues through which they immediately pass* while the lesions resulting from scleral ruptures and penetrating wounds of other kinds are more far reaching and destructive in character. The following cases are examples of recovery from gunshot wounds:

The first one is an illustration of Noyes' declaration that in these cases of gunshot wounds it is "impossible to decide what has happened." It is also an example of those rare instances where small missiles, other than birdshot, have gone completely through the globe.

Walter H., æt. 21 years, came to me at the Moorfields (London) clinic of Mr. Lang in July, 1889, and gave the following account of himself:

At the age of 14 he was shot in the face, receiving a charge from a shotgun loaded with small pieces of stone (shingle). He was about a dozen yards distant from the gun when it exploded. Pieces of stone were removed from his "mouth" and face but none, as far as could be ascertained, from the eye.

[3] "Manuel d'Ophtalmologie." DeWecker et Masselon, p 62.

He suffered from severe headache for a month after the injury during which time there was no sight whatever in the wounded eye. Then it began slowly to return and he now sees as well as he has done for several years past. On making a careful examination some slight scars were found on the face and one small one on the left lower lid about 4 mm. from its margin and equidistant from the inner and outer canthus.

This latter cicatrice corresponds to a whitish puckering of the palpebral conjunctiva which, however, is situated a little higher up than the dermal scar. Patient says there was no wound of the eyeball and no scar of cornea or sclera can be discovered. His eye was perfectly sound before the injury and he thinks there has been no varaition in his visual power for many years. When he closes his right eye he does not see the middle of objects fixed by the left eye. The top and bottom of articles of furniture and the periphery of smaller objects are distinctly visible, but their central portions are not perceived. This partial vision in the left eye has never bothered him. He has not had diplopia or squint.

R. E. V.=$^{6}/_{VI}$; L. E. V=fingers at 3 metres.

Left eye—pupillary reaction to light and accommodation (convergence) normal. Of a quill pen held 50 cm. in front of the eye he sees only the two ends and not the middle part. No improvement from glasses. Tension normal. An ophthalmoscopic examination of the left fundus shows the media to be clear; there are absolutely no opacities in the vitreous. The papilla has a small and deep physiological excavation. From its lower border there projects a slight elevation the refractive difference between whose base and summit is about one diopter. It is kidney shaped. about one half a disk diameter in length and about half as broad as it is long. Its summit is quite white and is studded with cholesterine crystals, the whole making a beautiful ophthalmoscopic picture. The macular region is the seat of an old choroiditis with blotches of pigment. Three disk diameters directly outwards towards the temporal side of the disk is a large atrophic area, whitish in color, over whose surface are scattered small spots of pig-

ment. The retinal vessels are not diminished in size and they run over the pigmented dots in several places. The infra-papillary elevation is free from pigmentation. Here and there in the area of choroidal atrophy an occasional crystal of cholesterine is to be seen.

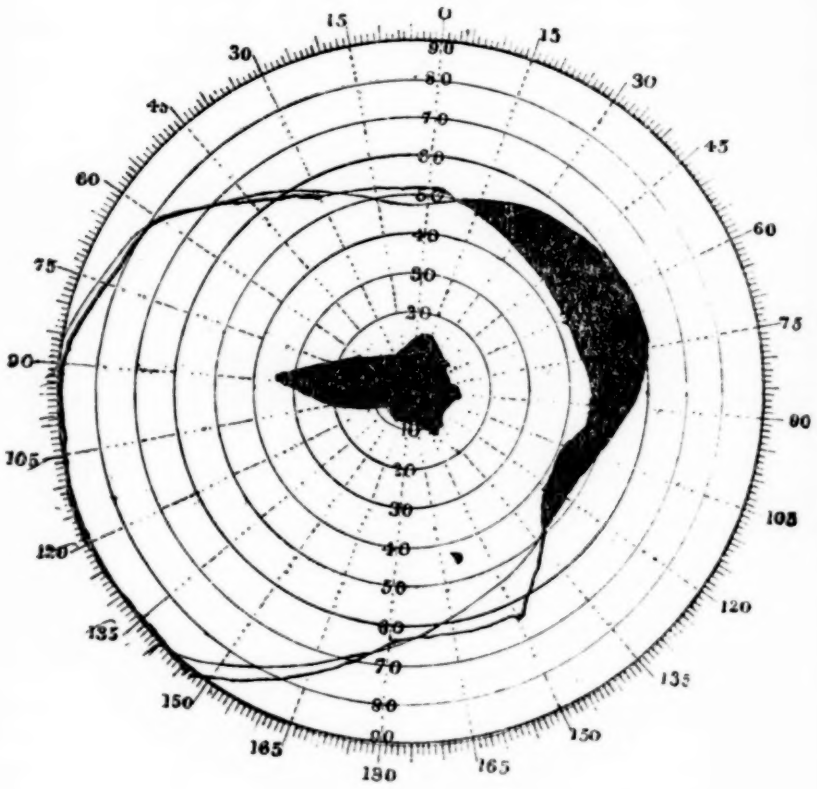


FIG. 12.

The absolute scotomata corresponding to the injured fundus are shown in the accompanying perimeter chart.

It will be seen that the periphery of the field is quite uncontracted, excepting a restriction of the (apparent) inner side,

the important loss of vision being chiefly confined to an irregular area about the fixation point.

If one might venture a guess as to what happened to this eye seven years ago it would be that more than one small splinter of stone has pierced the globe outside of and yet quite close to the ciliary body, passed through the vitreous and penetrated the opposite sclerotic wall in more than one situation. It may be that the projection at the nerve border corresponds to an encapsuled foreign body part of which is still in the sclerotic coat. The peripheral contraction of the field is doubtless the result of an injury to one or more bundles of temporal nerve fibres (supplying that part of the retina) as they issue from the papilla; it does not express the presence of a large nose during the several examinations made. It was impossible to discover behind the overhanging iris any ophthalmoscopic indications of the exact spot where the foreign bodies entered the eye.

There is nothing abnormal about the fundus of the right eye, in which he has never had any indications of sympathetic trouble.

The next case shows an injury far more extensive than the preceeding and yet the eye was not lost nor was vision entirely abolished.

It is that of an Italian, I. B., æt. 30 years, who presented himself at Dr. Coleman's clinic in the Post Graduate School. Fifteen years before he had been shot in the left eye, several small shot having entered the globe. After the accident he was not able to see very much but his vision was then better than it now is. This is explained by the fact of his having been struck in the same eye with the fist two years ago. Since that time his vision has been getting gradually worse. About the centre of the left lower lid, 10 mm. from its margin, is a round cicatrix 3 or 4 mm. in diameter. This corresponds to a scar, somewhat smaller in size, in the palpebral conjunctiva. When the patient looks in front of him this scar is in contact with a puckering in the anterior wall of the eyeball—a puckering which includes both ocular conjunctiva and sclerotic coat.

The depression is plainly seen when the patient looks upward and it has about the same diameter as the external lid wound.

V. L.=fingers at 30 cm. eccentrically.

V. R.=$^{6}/_{VI}$.

When the right eye is covered patient directs his gaze to one side for the purpose of seeing objects directly in front of him, yet he does not squint. He has not in either eye nor has he had for years any pain, tenderness, or lachrymation. Tension in left eye normal; pupil very little affected by light. The eye is perfectly "quiet." The cornea is clear; iris of normal color but tremulous. The lens is translucent only and is dislocated upwards. It is not possible to see the fundus. Dr. Coleman decided to remove the crystalline and as a precautionary measure made use of Agnew's bident. The patient recovered from the operation without a bad symptom. Two weeks afterward his eccentric vision had slightly improved. An examination of his fundus could now be made and it revealed a rather curious state of things. A large whitish area occupied the infra-macular region and stretched irregularly, as far as could be seen downward and to the nasal side of the disk. A portion of the margin of this irregular spot was plainly marked and looked like the border of a choroidal rupture. The whole area was probably three disk diameters across in its widest part and was almost entirely white, there being little or no scattered pigment to be seen. Refractive differences of about half a diopter could be made out in various parts of this abnormal locality. The papilla is not of markedly abnormal color. The blood vessels are not atrophied except those of them that stretch into the area just mentioned. Two vessels (arteries?) appear to run toward it from the disk down and inward, but do not appear near the margin. I could not determine whether the retina had its normal appearance in all parts or not. There was enough opacity of the media to prevent a clear view of the fundus details by the direct method. At any rate there were certainly no gross lesions in the disk or in the macular region.

The accompanying chart can only be approximately correct as it was not possible to secure accurate central position, but it

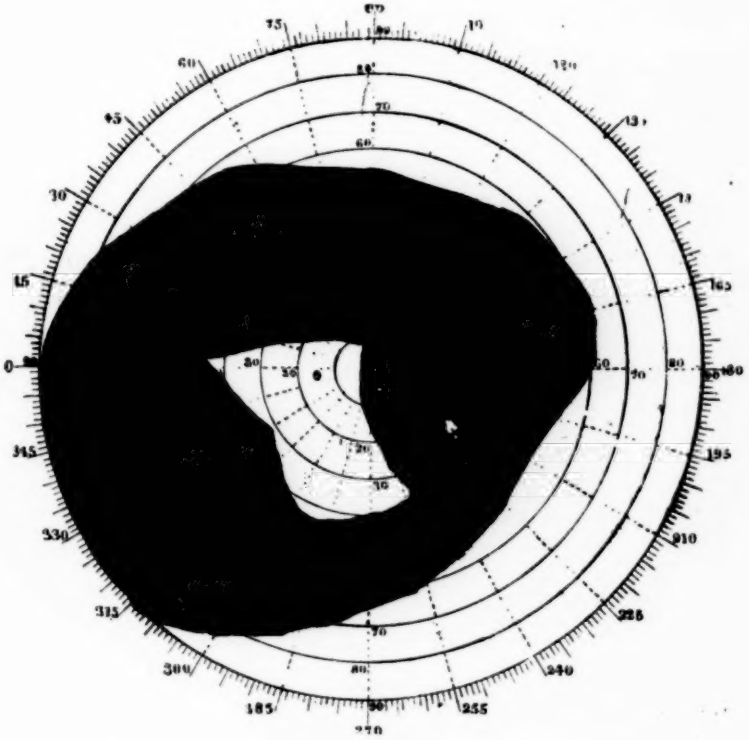


FIG. 13.

indicates fairly well the extent of the visual field so far as it concerns a white object 20 mm. square at 50 cm.

OBITUARY.

DR. H. CULBERTSON.

ZANESVILLE, O., June 19, 1890.

ADOLF ALT, M.D., *Dear Doctor.*—I have to communicate to you, that my father, Howard Culbertson, has passed away. His death occurred yesterday, and was caused by acute dysentery. His illness was brief, lasting less than a week.

Respectfully yours, LOUIS R. CULBERTSON, M.D.

In communicating this letter to our readers we need feel the sad loss with the bereaved family. All our readers know how enthusiastic the late Dr. H. Culbertson was as a collaborator of this journal. He was an earnest seeker after truth, and by his prisoptometer he has gained for himself a reputation beyond the limits of his own field of work. His memory will be sacred among us.

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